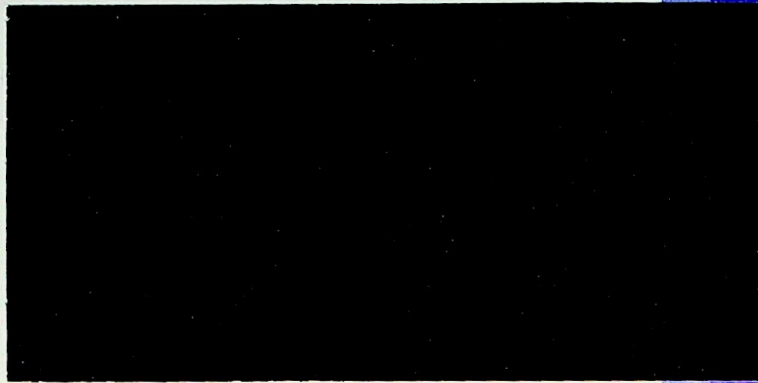
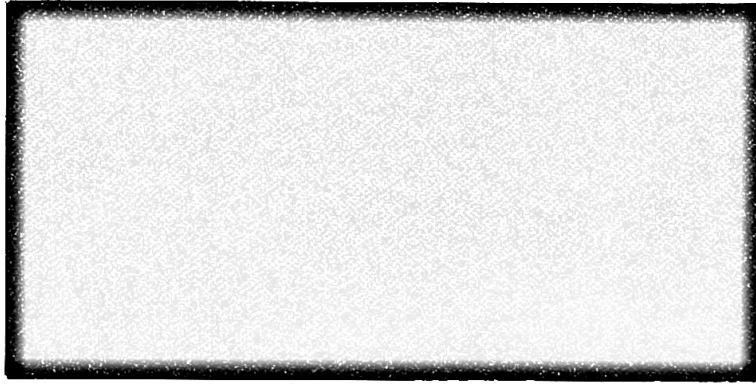


JOHNSON-LAIRD, INC.





*MP/M for the Onyx C8001 128/256K*

Version 1.1.2  
8th August 1981

Johnson-Laird, Inc.  
1556 SW 66th Avenue  
Portland  
Oregon 97225

(503) 292-6330

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## MP/M 1.1.2 on the Onyx C8001 Multi-User

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## Introduction

### Scope of this Document

This document is an Addendum to the manual "CP/M on the Onyx C8001" (previously published and distributed with CP/M\* 2.2); copies of which accompany each copy of MP/M\* 1.1. This document highlights the differences between MP/M and CP/M implementations, both for the Operating System itself and for the utilities released with it (the latter being direct descendants from their CP/M counterparts). (\* MP/M, CP/M, CP/Net and CP/NOS are Trademarks of Digital Research).

First time users of Digital Research products on the Onyx C8000 should familiarize themselves with the overall details of CP/M by reading "CP/M on the Onyx C8001" and then read the remainder of this document.

### Revision History

This document has been revised to reflect the changes made for version 1.1.2. This version supports from 1 to 4 terminals, both the 128K and 256K RAM systems and both the 10Mb and 20Mb hard disks.

The standard release tape contains the necessary files to allow you to configure MP/M to your specific requirements. Specific examples of using the GENSYS (Generate System) utility are provided.

The automatic startup of procedure files 1.SUB and 2.SUB has been removed because of undesirable side-effects.

### MP/M Overview

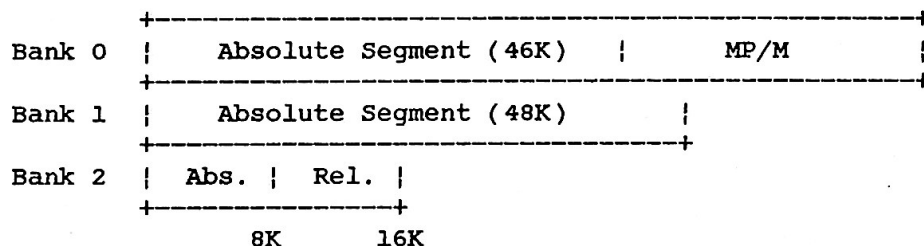
MP/M is the successor product to the now *de facto* industry standard Operating System, CP/M. MP/M, as implemented on the Onyx Z80 128K/256K RAM computer system, will support from two (128K) to five (256K) independent users. MP/M memory is divided into "absolute" and "relocatable" segments. Absolute segments begin at location 0000H in each bank and use the same conventions as CP/M for locations 0000H to 0100H. Relocatable segments can begin at any address which is a multiple of 0100H.

In general, existing CP/M ".COM" files can execute in an absolute segment without change. MP/M automatically assigns the first available, "best fit" segment to the ".COM" to be loaded. Thus, existing CP/M ".COM" files can run under MP/M provided firstly, they have sufficient stack space assigned to allow an interrupt to occur (which requires an additional 16 bytes of stack space) and secondly, they do not make un-authorized calls directly to the Basic

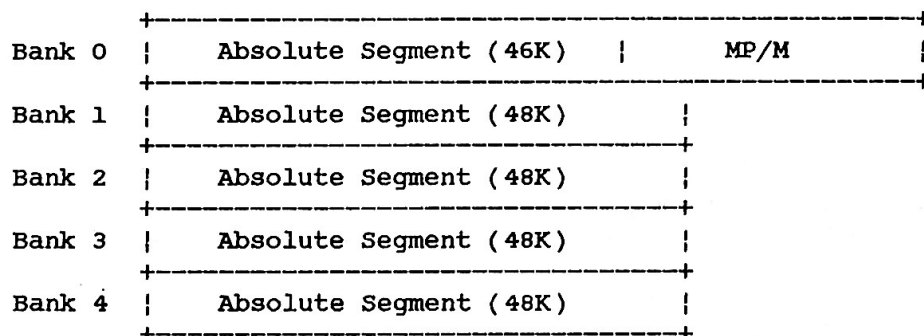
Input/Output System (BIOS). If both of these are not satisfied, the ".COM" file will not function under MP/M.

Relocatable segments are used to execute page-relocatable programs (of type ".PRL"). Utilities are supplied to create ".PRL" files from the output of any language translator. A ".PRL" type program can be run in an absolute segment if that is all that is available in the memory space when the program is initiated. ".PRL" files are about 12% larger than the corresponding ".COM" file and contain additional information (a "bit-map") to allow MP/M to relocate the program to any relocatable segment boundary.

In the normal 128K RAM system, memory is organized as shown below :-



For the 256K byte RAM system, memory is organised :-



As an example of memory use, the MP/M system "boots" into the upper part of memory leaving sufficient memory for a 46K Absolute Segment in Bank 0. Two independent copies of Microsoft BASIC (Interpreter or Compiler) can be loaded and executed concurrently in the 128K RAM system. One copy will be loaded into the 46K absolute segment, the other into the 48K RAM segment. If one user wishes to inspect a disk directory during the compilation, they can "detach" the console from the segment running the compiler or interpreter and request MP/M to execute the "DIR" command. MP/M will then attempt to load the relocatable version of DIR, and on finding that there yet remains an absolute segment free will load into Bank 2. When the DIR command is completed the user re-attaches to the compilation again.

All of the programs necessary to reconfigure the MP/M memory configuration are provided (in binary form) so that the user can reconfigure to meet special requirements.

The file system under MP/M is identical to that of CP/M. The 10 Megabyte disk is divided up into a reserved area (276Kb), and three "logical disks" (1.3Mb, 3.96Mb, 3.96Mb). An additional 10Mb disk may be "daisy-chained" and is configured identically to the first disk.

MP/M also supports the same "User Number" concept as CP/M. The user number effectively protects one user's files from another. The Onyx implementation of MP/M causes automatic execution of a unique command file (a SUBMIT file) for each terminal; the release command files cause the Terminals to come up in User 1 and 2 partitions respectively.



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All files in User 0's partition may be read from all other user partitions. Thus a single copy of a program kept in User 0 may be accessed by all users.

MP/M supports sequential and random file types. ISAM and B-tree file managers are also available.

Files destined for output to the printer may be written to the disk and then subsequently printed while the terminal is being used for some other task (file "spooling"). Unlike DESPOOL (the CP/M equivalent), the MP/M SPOOL program is interrupt-driven and therefore transmits data to the printer in a more-or-less continuous stream.

The baud rates of the Serial Printer and terminals can be set by program, as can the Protocol used by the Printer; protocols of DTR high-to-send, Xon/Xoff and Etx/Ack can be selected. By using the automatic SUBMIT file capability, the system can be configured each time MP/M is initiated.

Backup capabilities include the ability to write logical disks to tape and to re-load in any combination. In addition, the ARCHIVE utility (priced separately from MP/M) backs up and loads individual files. A directory is maintained on each Archive tape. With Archive multiple files of the same name may exist on the same tape; a specific version of the file can be selected and reloaded. Files may also be backed up and reloaded using "ambiguous" file names.

MP/M provides "Master" system capability when used with the Networking Packages CP/Net and CP/NOS. "Slave" computer systems run CP/M and either CP/Net (if they have their own local disk storage) or CP/NOS (if they do not have local disks).

The standard utility programs provided with MP/M are :-

- \* ABORT - Aborts a running process.
- \* ASM - 8080 Assembler (Non-macro, absolute).
- \* CONSOLE - Displays current console number.
- \* DBACK - Logical Disk Backup to tape.
- \* DDT - Dynamic Debug Tool.
- \* DIR - Displays Disk Directories.
- \* DLOAD - Logical Disk Load from tape.
- \* DSKRESET - Resets Disk System.
- \* DUMP - File Dump (Source code as an example).
- \* DVFY - Logical Disk Backup Tape Verify.
- \* ED - Text Editor.
- \* ERA - File Erase (Delete).
- \* ERAQ - File Erase (but Query the user for each file).
- \* GENHEX - Generate file of type ".HEX" from memory.
- \* GENMOD - Generate file of type ".PRL" from ".HEX".
- \* GENSYS - Generate MP/M system (with new memory configuration).
- \* LOAD - Generate file of type ".COM" from ".HEX".
- \* PIP - Peripheral Interchange Program (Sophisticated file copy).
- \* PRLCOM - Generate file of type ".COM" from ".PRL".
- \* RDT - Relocatable form of DDT.
- \* REN - Rename files.
- \* RX - Receive files (from other computers running TX).
- \* SCHED - Schedule auto-execution of programs by Date and Time.
- \* SPOOL - "Spools" disk files to printer concurrent with other processes.
- \* STAT - Status of Disks (available storage, etc.).
- \* STOPSPLR - Stops print Spooler.
- \* SUBMIT - Submits command files for automatic execution.
- \* TOD - Time or Date set/display.
- \* TX - Transmit file to computer running RX.
- \* TYPE - Type file on console.
- \* USER - Change console to different user partition.

Separately priced utility programs/packages include :-

- \* ARCHIVE - File-by-file backup and load to/from tape.
- \* DSTAT - Displays disk usage (%) by User partition number.
- \* ERASEALL - Erases All files (for all users) on a logical disk.
- \* FILESET - Creates command files for ARCHIVE.
- \* FINDALL - Finds all files of given name (searches all disk/users).
- \* INVIS - Moves files to User 0 and sets Read Only, System Status.
- \* MOVEF - Moves files from one user number to another (without copying).
- \* PROTOCOL - Selects Serial Printer Protocol.
- \* SPEED - Changes baud rate speed for Serial Ports.
- \* UNERA - Restores files accidentally ERASed.
- \* VIS - Moves files from User 0 and resets to Read/Write, Normal Status.
- \* Tape Cartridge Drivers (Relocatable binaries).
- \* BDS "C" Libraries (Source) for Disk/Tape Interfacing.
- \* SID - Symbolic Interactive Debug (enhanced DDT - 8080 Flavour).
- \* ZSID - Z80 version of SID.

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For the more technically oriented users wishing to write programs that utilize the internal features of MP/M a detailed manual is provided that describes each system call.

MP/M supports multiple concurrently executing processes, including re-entrant processes (such as are found in CP/Net). In addition, MP/M has a general-purpose queuing facility which provides single-bit "flags" for process synchronization, counting semaphores for mutual-exclusion of shared resources, circular byte queues for character buffers, and word queues for passing pointers to objects, and general message queues for sending data "by value" from producer processes to consumer processes. The internal system clock ticks once every 50 milliseconds and, by way of a bit flag, can be accessed programmatically.

MP/M shares with CP/M the advantages of an incredibly wide range of language products and applications packages available from software houses world-wide. The language products that can be supplied for the Onyx computer include :-

- \* ANSI Standard COBOL (Microfocus, Microsoft, Ryan-McFarland)
- \* FORTRAN (with RATFOR preprocessor)
- \* Business BASIC II Interpreter
- \* BASIC Compilers and Interpreters
- \* CBASIC2 (with PEARL program Generator)
- \* PASCAL Compilers and Interpreters
- \* "C" Compilers and Interpreters
- \* PL/I Subset G
- \* PL/M (Intel's Language)
- \* APL
- \* LISP
- \* ALGOL-60
- \* FORTH
- \* Structured Assemblers (SMAL/80)
- \* Assemblers (Macro and/or Relocatable)
- \* Linkers
- \* 2-Dimensional Video Text Editors
- \* Word Processing Packages
- \* Name and Address and Mailing List Packages
- \* Text Formatters (Daisy-wheel and Sanders Typographic Printers)
- \* Multi-key Sort/Merges (with SELECT/EXCLUDE options)
- \* ISAM and B-tree file managers
- \* CODASYL and Specialized Data Base Management Systems

Application Packages available include :-

- \* General Ledger
- \* Accounts Payable
- \* Accounts Receivable
- \* Payroll (Restaurant and Regular)
- \* Job Costing
- \* Apartment Management
- \* Professional and Medical Billing
- \* Management Information Systems
- \* Inventory Control
- \* Sales Order Processing

### Important Definitions

#### MP/M Definitions

The following discussion will be confusing unless certain terms are defined.

MP/M is a Multi-Terminal, Multi-Tasking Operating System. Simply put, it can do more than one thing at a time for more than one person, each person having their own terminal. At one end of the spectrum, a single person, using a single terminal can have more than one thing happening in the system at a given moment. At the other, several people can each have one thing happening (for them) at a given moment.

Some definitions are in order :

- \* "Terminal". A single computer terminal used by a single person. Sometimes referred to as a "Console".
- \* "User". A concept used within both CP/M and MP/M - but in the context of separating disk files belonging to one person from another. The "User Number" associated with Files is a number from 0 to 15. It is prefixed onto all file names so that when a *terminal* is switched to a given *user number* the files belonging to other *user numbers* are protected and cannot be damaged from the terminal. A better term for "user number" would be "file group number". Do not confuse a file user number with the *terminal* or *console* number.
- \* "Multi-user". In this context, this really ought to be "Multi-terminal". However, "Multi-terminal" has an additional flavor associated with it. It implies that a single application program is servicing the needs of several terminals; as opposed to "Multi-user" which implies several terminals running programs independently of each other.
- \* "Task". A single chunk of program code running in the system. A given person can *own* more than one task, or the same task can be working on behalf of several people (in which case it is called a "re-entrant" task - it can be "entered" (used by) more than one person.
- \* "Multi-tasking". Any system that "zig-zags" from one task to another, giving more than one task the opportunity to execute in the CPU. The Operating System will change from one task to another ("context switch") either because an active task does something that the Operating System knows is going to involve waiting, or because the allotted chunk of CPU time has expired ("time slice").

To summate, MP/M is a *Multi-terminal, Multi-tasking* Operating System.



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Disk Definitions

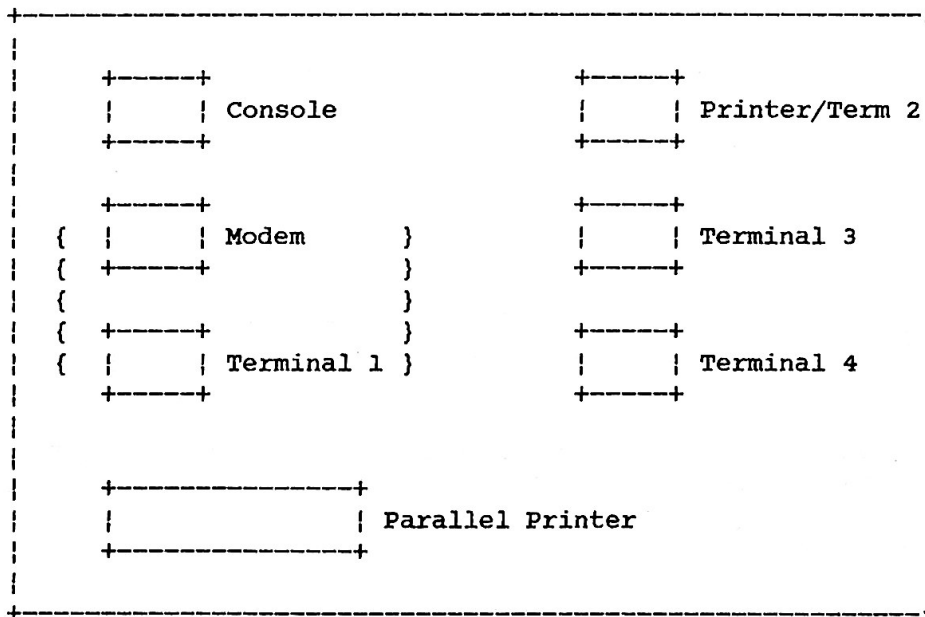
The Onyx computer is normally sold with a single physical Winchester Disk capable of storing either 10 Megabytes or 18 Megabytes depending on the model of disk.

The software views a single physical disk as being divided up into three *logical* disks. To the software they could equally well be physical disks - coincidentally the three logical disks reside on the same physical device.

See the section on "Disk Organization" in the "CP/M on the C8001" manual for exact sizes etc. (Page 14).

Connecting up the TerminalsPhysical Connections

The back-panel of the Onyx has several connectors arranged like this :-



The "Console" is the first Terminal Connector.

The "Modem" and "Terminal 1" connectors are really the *same* connector wired differently so that either a Terminal or a Modem device can be connected without having to use different connecting cables.

For the 128K computer, connect up the devices as follows :-

\* Console - The first Terminal.

\* Terminal 1 - The second Terminal.

Connect up the printer either to the Serial Printer Port (also marked "Term 2", or to the "Parallel Printer" port depending on the type of interface that the printer uses.

For the 256K computer, if the printer is serial, connect it up to the "Serial/Term 2" connector and the four terminals (which is the maximum that can be supported with a serial printer) to "Console", "Terminal 1", "Terminal 3" and "Terminal 4" respectively.

### Baud Rates

The default Baud Rates for the various serial ports are as follows :-

- \* Terminals (and modem) - 9600 baud.
- \* Serial Printer - 1200 baud.

The baud rates may be changed using the SPEED utility. This is described on page 57 of the "CP/M on the Onyx C8001" manual. It has been extended to set the baud rates of additional ports on the Multi-User computer.

Note that under MP/M the "tick rate" of the Real Time Clock cannot be altered as it could be with the CP/M version of SPEED.

To display "help" information, enter the command :-

SPEED

### Protocols

Owing to memory limitations, the serial protocols supported are less flexible than under CP/M. Terminal ports can only support Xon/Xoff protocol. They do not support DTR high-to-send (that is, pin 20 of the Serial Port connector need not be connected to a positive voltage).

Only the serial printer can support a range of protocols. The specific protocol(s) selected are set using the PROTOCOL utility. PROTOCOL is documented in the "CP/M on the Onyx C8001" manual on page 55.

To display "help" information, enter the command :-

PROTOCOL

The default protocol for the serial printer is DTR high-to-send and Xon/Xoff. A new feature of PROTOCOL under MP/M is that DTR high-to-send may co-exist with either Xon/Xoff or Etx/Ack.

### Printer Assignment

Again, because of memory limitations, the range of options for peripheral assignment under MP/M is limited in comparison to CP/M.

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Only the printer can be assigned; either to the Serial Port or to the Parallel Port.

To display "help" information, enter the command :-

**ASSIGN**

The default state is that the printer is assigned to the Serial Port.

How to Change Default Settings

Under MP/M, there is no FREEZE utility to make permanent the changes made to baud rates, protocols and assignments.

Using the SUBMIT files that are executed automatically on system startup, specific invocations of SPEED, PROTOCOL and ASSIGN can be made to change attributes as soon as MP/M is initiated. The "Automatic SUBMIT Files" are discussed in the next section.

### Installing MP/M

In order to install MP/M you need to do the following things :-

- \* Read this manual!
- \* Load the Release Tape Cartridge onto the Onyx Disk.
- \* Run the GENSYS utility to build MP/M to your requirements (Procedure files and examples are supplied).
- \* Bring Up the configured version of MP/M.
- \* Run the ERASEALL utility in order to wipe clean the directories of the additional logical disks.

### Contents of the Release Package

The standard MP/M release Package contains the following items :-

- \* A Software Distribution Tape Cartridge. This contains MP/M itself, along with the standard system utilities plus any packages ordered specially.
- \* This MP/M documentation.
- \* "CP/M on the Onyx C8001" manual (produced by Johnson-Laird, Inc.).
- \* Digital Research Manuals :-
  - MP/M Users Guide
  - CP/M 2.2 Users Guide
  - Introduction to CP/M Features and Facilities
  - CP/M Assembler Users Guide
  - CP/M Editor (ED) Users Guide
  - CP/M Dynamic Debugging Tool (DDT) Users Guide
  - CP/M 2.2 Interface Guide
  - CP/M 2.0 Alteration Guide

### Loading the Software Distribution Tape

To load MP/M onto an otherwise "empty" system, press the System Reset button (or power the system on!). When the "\*" appears after the Self-Test has executed, enter either "T" or "t" in order to execute a Tape Bootstrap operation.



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The Tape Boot will load and identify itself and in turn load the Software Distribution Tape Loader. This, too, will sign-on, and then read the SDT Label and display it on the Console.

Enter a Carriage Return to continue the SDT load process.

The first question that LOADSDT asks is for the number of tape tensioning passes. If the Tape Cartridge has not been used for some time, or has been shipped recently (and been exposed to a changing environment) it is a good practice to specify three re-tensioning passes. These are high-speed passes down the tape and back and serve to uniformly tension it.

Note : There is still an obscure but benign bug in the LOADSDT program. Tape Error - 15's occur after you have requested retensioning passes. You have two choices :-

- \* If you get these messages during the tape loading, deliberately pull the tape cartridge out of the drive and then press the Reset Button on the back-panel. Then, when the self-test completes, enter T to load LOADSDT again. This time, do not ask for any re-tensioning passes.
- \* Ignore the messages. Despite appearances, the LOADSDT process will complete without any problems.

LOADSDT then asks whether this is a first-time installation of MP/M on the system. If it is, type "y". LOADSDT will output a reminder to use ERASEALL (see page 51 of the "CP/M on the C8001" manual) to create empty MP/M-style directories for logical disks B: and C:. This reminder message is the only special action taken if a "y" is entered.

LOADSDT will then ask whether the Reserved Area (that contains the system Bootstrap code and the MP/M loader) is to be loaded. For a first-time installation, enter "y". It then asks whether drive A: is to be loaded. Again, for a first-time installation enter "y". LOADSDT will then proceed to load up the disk with MP/M and the utilities, displaying an increasing sector number as the load progresses.

Once the load has completed (it takes about 3 minutes), LOADSDT displays further instructions that require another system reset. When the "\*" appears after Self-Test completion, enter a Carriage Return in order to load and enter MP/M.

As the load progresses, the name of each module, its length and address (in hexadecimal) appear on the Console Screen. The load process terminates with a display of the memory segments as discussed in the MP/M Overview at the front of this document. A more detailed discussion of the output, with examples, can be found in the Digital Research MP/M User's Guide (pages 114 and 115).

Once MP/M has been loaded, it signs on with an identifying message on the main console terminal. All other terminals show just a simple prompt of the form :-

```
OA>
^^
||
|+----- The Default Logical Disk used in commands unless
|          specified otherwise.
|
|+----- The User Number (File Group) in which this
|          terminal is currently working.
```

Configuring MP/M

The version of MP/M on the release tape is built to support two terminals, 128K of RAM and a 10Mb disk. If this is not the configuration that you need then enter one of the following commands :-

SUBMIT MAKE10MB (To make a 10Mb system)

....OR

SUBMIT MAKE20MB (To make a 20Mb system)

These procedures copy and rename some files and then lead you into the GENSYS utility. Before they call GENSYS, they display on the screen the console dialogue for a typical GENSYS run. You can then follow-through the dialogue entering the correct responses.

The only choices you need to make are :-

- \* What size of disk do you have? You will have indicated this choice by which file name you entered after the SUBMIT.
- \* How many terminals do you want to run? This is a maximum number; if you enter 4, you can run MP/M with either 1, 2, 3 or 4 terminal. The number that you tell GENSYS does have a bearing on the amount of memory available to you in Bank 0 though. This is covered in the following paragraphs.
- \* What size memory is in the computer? This will determine the numbers that you enter for GENSYS. The example console dialogue that will be on the screen when GENSYS is loaded will show the entries for both the 128K RAM system and also the 256K.

The first memory segment numbers that you enter do require some thought.

Considering the 128K RAM system first. The numbers you enter for this first memory bank will vary depending on the number of terminals that you have previously specified to GENSYS. The entries should be :-

For the 10Mb		For the 20Mb	
0,B9,0,0	1 console	0,B6,0,0	for 1 console
0,B8,0,0	2 terminals	0,B5,0,0	2
0,B7,0,0	3 terminals	0,B4,0,0	3
0,B6,0,0	4 terminals	0,B3,0,0	4

For the 256K RAM system, the normal entry for this first memory segment is :-

For both 10 & 20MB 1,B0,0,0 For 1, 2, 3, or 4 terminals

Note the first number, 1. This tells MP/M that this bank of memory starts at location 0100H, rather than 0000H as was the case for the 128K RAM system. Doing this means that MP/M will never try and load a ".COM" file into this

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first bank. The reason for doing this relates to a problem inside MP/M itself. Programs such as ARCHIVE are quite large - larger than memory segment 0, but smaller than memory segment 1. Telling MP/M that memory segment 0 does not start at 0000H forces it to look for another memory segment into which to load programs such as ARCHIVE.COM. You can ignore the later comments about the utility called HOLDSEG0.

Once the GENSYS procedure has completed (it takes about three minutes all together), you must load the new version of MP/M before going any further. To do this, enter the command :-

**MPM**

This is much faster than pressing reset and waiting for the self-test to complete.

If MP/M starts to load, displays the memory map and then fails to give you an "OA>" prompt, check the load map and make sure that the first memory segment ends *below* the lowest part of MP/M itself. GENSYS does not tell you that you have built a version of MP/M that cannot possibly be loaded.

**Setting up Directories for Disk B: and C:**

As mentioned in the discussion above for LOADSDT, the ERASEALL utility (included on logical A:) must be run in order to create "empty" directories for disks B: and C:. See the "CP/M on the Onyx C8001" manual (page 51) for more information on ERASEALL.

## Major Differences between MP/M and CP/M

### Differences perceived from a Terminal

#### MP/M Prompt

As described above, each time MP/M indicates that it is ready to accept another command it will display the current User Number followed by the current default logical disk. In order to determine which *Console* MP/M associates with which terminal, use the CONSOLE utility as described in the MP/M Users Guide (page 8). This Console number is important as it is displayed alongside program names when MPMSTAT (Users Guide page 13) and is needed when a program must be ABORTed (Users Guide page 16) from a Console other than that which initiated it.

#### Processing Speed

The overall processing speed of a given program will appear to be slower than under CP/M. Furthermore, as the activity mix changes, printer and console output rates will vary considerably.

#### DIR, TYPE, ERA, USER Commands

The DIR, TYPE, ERA and USER commands are no longer built into MP/M. This means that, unless a copy of these utilities are placed in User 0 on all logical disks, they will need to be prefixed by a disk identifier, "A:TYPE file".

#### Public Files on User 0

As mentioned previously, files in User 0 are accessible for reading from all other user numbers. User 0 files cannot be ERAsed or written to even if those files are Read/Write Status.

#### Lack of Type-ahead

With CP/M, keyboard characters could be entered even when an executing program was not ready to accept them, and except for those programs that "gobbled up" characters (looking for Control Characters), the characters "typed ahead" would be buffered up until they were called for.

Unfortunately MP/M itself is one of those programs that "gobble up" characters! No type-ahead feature is possible, even though keyboard entry is interrupt-driven.

#### Lack of XSUB command

The XSUB command does not exist under MP/M. At present there is no functional replacement. However, MP/M 2.0



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promises to have a greatly enhanced SUBMIT file processor.

### Lack of SAVE command

The function of the SAVE command is now performed by MP/M's DDT package. See the description of the new features on page 148 of the MP/M User's Guide. Note that the value specified is odd! Firstly it is the number of 128 byte sectors to be written, secondly, the value is entered in hexadecimal!

### Loading Programs - Memory Allocation

One of the biggest "bugs" discovered in MP/M is its inability to cope with :-

- \* Small programs ("COM" files) that, when loaded, proceed to use upper memory for buffer areas. This poses a problem because MP/M makes some primitive decisions as to which memory segment to load the program into based on *the size of the COM file* NOT the size of memory actually used by the program once it starts execution. Custom Utilities such as ARCHIVE, DBACK etc are examples of this. One remedy is to "save" (DDT) the programs such that the resulting "COM" file is actually representative of the memory required. Another option is to use the special utility program HOLDSEGO (see the following description of ARCHIVE and LOADREL changes, or call up HOLDSEGO to see what it does).
- \* Programs that are too large to fit into the first memory segment. Consider the case of a program that requires 0B701H bytes. The first memory segment is 0B700H bytes in size (see the MP/M Overview Diagrams at the front of this document). Rather than sensing that it will not fit into the first segment but *will* fit into the second (which is 0C000H bytes long), MP/M valiantly loads it into the first memory segment only to discover "Prg Ld Err". Again, the remedy is to use the HOLDSEGO utility to "block" segment 0 for long enough to force MP/M to load the required program into segment 1 (where it will fit).

### Running CP/M ".COM" programs

In order to be able to predict whether an existing "COM" file will run under MP/M, the following conditions must be satisfied :-

- \* The program must have allowed sufficient Stack Space for the additional 16 bytes or so needed to handle interrupts (CP/M never officially functioned with interrupts). In general this does not present a problem, most programs having more than enough spare stack space.
- \* The program must not make any direct BIOS calls. This is vital. Firstly, the BIOS cannot be located in the same way as under CP/M, and secondly, the code in the BIOS serves multiple Consoles and cause a system crash if entered in an "uncontrolled" way. As an example, early versions of Micropro's Wordmaster instantly crash the system (they make direct BIOS calls).

Multi-Tasking

This is probably the most striking difference. It is easier to experience than it is to describe. A given console is not irrevocably "glued" to an executing program. Providing the program is making Console Status calls (in order to be able to detect the Control Character entered), the Console may be "Detached" from the executing program. This is achieved by typing Control-D. MP/M will respond with a fresh prompt (meanwhile the original program continues execution). Further MP/M commands can be entered, even new application programs can be initiated given that sufficient memory is available.

If the original program decides to send data to the Console or request input from the Console it will become "suspended" while MP/M waits for the Console to be attached to it again. To re-attach the Console, type Control-D again, and any pending output from the first task will appear on the screen.

As an example, enter the following command sequence from a Console :-

```
OA>STAT *.*                <- Enter Ctl-D while STAT is off sorting
                             the files into alpha order
OA>DIR                      <- MP/M will re-prompt, so enter DIR
----- Data from DIR will start to appear.
----- Hit Ctl-D again in the middle of the DIR output
+++++++ The output from the STAT command will appear
+++++++ and on completion, the interrupted DIR output will appear.
```

As a final word, experiment! If MP/M fails to respond to the Control-D, it means that the program currently executing is not reading Console Status and therefore MP/M does not sense the Detach/Attach Request.

Many People - One Printer

Under CP/M, if Control-P is entered, data going out to the Console will be echoed to the printer too. The same is true with MP/M, except that only one console may "own" the printer at any one time. If a second console enters Control-P while data is going to the printer from the first console, a "Printer busy" message is displayed.

Control-Q can be used to obtain ownership of the printer in anticipation of wanting to send data to the printer. A console "owns" the printer until such time as another Control-P or Q is entered.

The mechanism used by MP/M to achieve the above is called a Mutual Exclusion Queue (page 54 of the MP/M Users Guide).

An alternative to waiting for the printer is to use the SPOOLer utility. The program in question should direct its printer output to a disk file instead. When the SPOOLer is invoked (see page 15 of the MP/M Users Guide), it copies the file from the disk to the printer. However it does so concurrently with other activities in the system, so all Consoles can be doing other things while files are being printed.

System Crashes

Clearly, MP/M is a much "busier" Operating System than CP/M. There are many more "concurrent" activities happening within the system at any given time. One of the drawbacks of using MP/M in a program development

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environment is that it is entirely possible for one suicidal program to die and take all other programs with it.

For the development environment it is better to run MP/M "single console" or to use CP/M on the computer (it is available for the C8001/128 and C8001/256).

If an application program "hangs" or dies quietly in its own segment, MP/M will continue to function, sharing time slices between all active processes (including the "dead" one). An indication of a "hung" program is that Console output reduces down to 20 characters per second (the time slice for each user is 50 milliseconds). If this happens, attempt to detach from the Console, run MPMSTAT to see what has happened and if necessary, run ABORT to remove the corpse from the system.

### MP/M and the Tape Cartridge

#### Tape Compatibility

In brief, DBACK, ARCHIVE and Release Tapes are completely compatible between CP/M and MP/M (both on the 64K, 128K and 256K computers).

Do not confuse Release Tapes with software Distribution Tapes - see page 31 of the "CP/M on the C8001" manual for more information on Release Tapes.

Software Distribution Tapes are *not* compatible between the 64K computer and the 128/256K computer. However, it is possible to load an SDT destined for a 10Mb Disk 128/256K computer onto a 128/256K computer that has an 18Mb disk.

As a point of note, the same is true for the 64K system - 10Mb tapes can be loaded onto 18Mb disks.

Housekeeper-style tapes (a relic from earlier CP/M 64K systems) are totally foreign to the 128/256K computer systems. Convert them to DBACK format using HLOAD on the 64K system.

#### Changes to DBACK, DLOAD and DVFY

DBACK, DLOAD and DVFY have been modified to run under MP/M. However the modification is internal and requires no user action. The effects of the modification will be noticed only when running the programs concurrent with other programs wishing to access the disk.

Internally, these programs "lock" the disk for the duration of their execution. That is, *no other disk accesses* will be permitted during the time that, say, DBACK is running. Keyboard entries will still be echoed at other Consoles, but no program loading or disk I/O will occur until DBACK terminates.

One minor side-effect is that at the moment in time when a tape block is being read or written, the Real Time Clock is disabled. This has the effect of making the clock lose time. As a general rule, check the system time (using TOD - page 15 of the MP/M Users Guide) after using one of these utilities.

#### Changes to ARCHIVE and LOADREL

Because of the apparent "bug" in the way in which MP/M loads programs larger than Segment 0 (see the preceding section, "Loading Programs - Memory Allocation"), a special utility program must be loaded *immediately* before either ARCHIVE or LOADREL is used. This program is called HOLDSEG0. Its sole purpose in life is to get loaded into memory segment 0 for long enough to force MP/M to load ARCHIVE or LOADREL into segment 1 (which in the 128K system is the only segment large enough to hold them).

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When HOLDSEG0 is loaded, it outputs an apologetic explanation to justify its existence, detaches from the console (to allow the ARCHIVE or LOADREL call to be made) and, after 15 seconds delay, automatically terminates leaving segment 0 free.

If you have built a version of MP/M such that memory segment 0 starts at other than location 0000H, then you can ignore the use of HOLDSEG0. MP/M will be forced to load programs like ARCHIVE and DBACK into some other segment as they are ".COM" files and must be loaded into an absolute segment (that starts at location 0000H).

As with DBACK etc., ARCHIVE and LOADREL stop the real-time clock whenever a Tape Block is being read or written. However the disk is not locked. Other programs may access the disk while ARCHIVE and LOADREL are executing.

New Feature for ARCHIVE

ARCHIVE version 1.1 and later now permit a "SAFE" Tape Cartridge to be used for those cases when Read-Only operations are required. Previously, the tape had to be Write-Enabled even to load programs from the tape to disk.

A message is output as soon as the Tape Cartridge is opened. This message indicates whether the current tape is Write-Enabled or not (and therefore whether the FBACK and TFORM commands are available for use).

Notes for Systems Programmers

Regenerating MP/M (GENSYS)

On the MP/M Distribution Tape there is a file called GENSYS.SUB. It cannot really be used as a SUBMIT file because of the absence of XSUB. However this file does contain the console entries input to GENSYS when building the release version of MP/M.

Refer to the MP/M Users Guide (page 110 and on) for more information about GENSYS.

The MP/M SDT also contains all the component files to rebuild a new configuration of MP/M. MPM.COM is a version of the MP/M loader that can be used to load a new version of MP/M while operating *under* MP/M.

GENSYS will gladly allow systems to be built that cannot possibly run (mainly because of memory related problems or because of custom Resident System Processes with bugs). It is recommended that all component files be copied to logical B: or C:, along with MPM.COM and GENSYS and that experimental versions of MPM.SYS are produced apart from the "real" MPM.SYS on drive A: (destroy this and MP/M cannot be brought up!). If A:MPM.SYS is damaged, the only recourse is reload from the SDT.

Note that the highest memory page available for MP/M is OFEH. The last physical memory page is used for interrupt vectors and other configuration management variables.

Adding File/Record Lock / Custom RSP's

MP/M 1.1 lacks any in-built method for locking both files and records against simultaneous update. One possible method for implementing such a scheme would be to create a custom Resident System Process (RSP) that would read a Linked List Queue for transactions generated by Application Programs.'

These transactions would be of the form :-

- \* Request Lock of File "XYZ", Record (or Sector) "n". A response would be generated based on the Success/Failure of the Request. The response would be written to an output queue for the Application Program to read.
- \* Request Unlock of File "XYZ", Record (or Sector) "n". Again, an output queue would be written to to provide acknowledgment of the request.

This RSP, in addition to creating and maintaining its communication queues, would also maintain an internal lock table identifying which Files/Records were locked.

Would-be implementors of this scheme must be wary of the memory requirements of such an RSP. Refer to the diagram on page 18 of the MP/M Users Guide. Note that MP/M and all RSP's must be located above address 0C000H

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on both the 128K and 256K machines (from 0C000H to 0FFFFH is common memory and is mapped in at all times).

Examine the load map produced as MPM.COM executes in order to determine the amount of available space.

Note that the easiest way to produce an RSP-type file is to purchase a copy of Digital Research's RMAC (Relocatable Macro Assembler) and LINK (which can be persuaded to output an RSP file directly). Microsoft's M80 can be used to generate a "REL" file for input to LINK if needed.

Time Critical I/O

A custom option has been implemented in Onyx Version of MP/M. This flag, when set to a non-zero value has two effects :-

- \* The Real Time Clock is stopped (actually the interrupt service routine returns immediately without doing any processing). This means that no clock related dispatch calls will occur.
- \* The currently selected memory bank is "locked-in".

It is this flag that is set immediately before a Tape transfer. Set this flag if a high data rate is anticipated when using one of the Serial Ports to capture incoming data, or when time-critical operations are about to happen.

The flag, known as CRITIO, is at location OFFD2H.







JOHNSON-LAIRD, INC.  
1556 SW 66TH  
PORTLAND, OREGON 97225  
(503) 292-6330

SOFTWARE PROBLEM REPORT (SPR)

SPR No. : \_\_\_\_\_

SPR Date : \_\_\_\_ / \_\_\_\_ / \_\_\_\_

~~~~~

Identification

SPR AUTHOR

CUSTOMER (if not author)

Name : \_\_\_\_\_

Location : \_\_\_\_\_

Phone No.: ( \_\_\_\_ ) \_\_\_\_ - \_\_\_\_

( \_\_\_\_ ) \_\_\_\_ - \_\_\_\_

Hardware : \_\_\_\_\_

Serial No. : \_\_\_\_\_

Software : \_\_\_\_\_

Version No.: \_\_\_\_\_

Problem Description (Give data to allow replication of problem!)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_

Problem Solution      Date : \_\_\_\_ / \_\_\_\_ / \_\_\_\_      Name : \_\_\_\_\_

\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
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- 1) Author : enter SPR, retain Gold copy, all others to J-L.
- 2) Author : on receipt of Solution, retain Yellow copy, White to Customer.

BOTTLENECK PROBLEM REPORT (BPR)

JOHNSON & JOHNSON



DATE OF BIRTH

NAME AND DESIGNATION

ADDRESS

BPR NO.

BPR DATE

1. PROBLEM IDENTIFICATION

2. CAUSE ANALYSIS

3. CUSTOMER (If not author)

4. ACTION PLAN (What steps will be taken to solve the problem?)

5. ACTION TAKEN (What steps have been taken to solve the problem?)

6. ACTION TAKEN (What steps have been taken to solve the problem?)



